

GEOLOGICAL REPORT

OF THE PROPERTY OF THE

LIBRARY
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Copperopolis
MINING COMPANY.

Location of Mine and Works,—Hancock County, Maine.

By W. F. Stewart, Geologist.

GEOLOGICAL REPORT

OF THE PROPERTY OF THE

COPPEROPOLIS

MINING COMPANY.

BY W. F. STEWART, GEOLOGIST.

622,343

3408

COPPEROPOLIS MINING COMPANY.

Office, No. 4 Sears Building, Boston.

ORGANIZATION.

President:

GEORGE E. HARRINGTON.

Treasurer:

S. L. SYMONDS.

Secretary:

W. OSCAR ARNOLD.

DIRECTORS:

GEORGE E. HARRINGTON, of Salem, Mass.

GEORGE WEST, of Salem, Mass.

FRANCIS TUCKERMAN, of Salem, Mass.

LEWIS W. HODGKINS, of Ellsworth, Me.

PATRICK MULLAN, of Ellsworth, Me.

Superintendent:

JOHN SHOENBAR, West Sullivan, Maine.

Geology



Digitized by the Internet Archive
in 2017 with funding from
University of Illinois Urbana-Champaign Alternates

<https://archive.org/details/geologicalreport00stew>

GEOLOGICAL AND MINERALOGICAL REPORT
UPON THE PROPERTY OF THE
COPPEROPOLIS MINING COMPANY.

LOCATION OF WORKS, HANCOCK COUNTY, ME.

By W. F. STEWART, *Practical Geologist*.

WEST SULLIVAN, MAINE, April 21, 1881.

TO the enthusiastic fossil hunter, the Atlantic border of Maine does not present an attractive field. The rocks here are azoic, and so far as yet explored, are all utterly barren of even a trace of organic life. In Penobscot County we encounter a few isolated patches containing *O. testudinaria* *Helicotoma planulata*, and other forms peculiar to the lower Silurian rocks; but in the counties of Hancock and Washington, nothing appears but the flexed and distorted strata of the lifeless Huronian and Laurentian. Notwithstanding the paucity of organic vestiges in these Archæan beds, their unsightly laminations are known to contain inexhaustible deposits of substances of vastly greater utility to practical people than a few dubious fossil remains. During the past third of this century, it has been proved beyond question, that the Archæan terranes of North America are as richly charged with the useful metals, such as iron, copper, lead, zinc, antimony, and the like, as any similar rocks on the globe; and the fact is just beginning to dawn upon the tardy perceptions of men, that these same Archæan terranes are heavily charged with the world's coveted metals,—gold and silver. There is possibly, no other mineralized region on the surface of this planet, where the deposits of galena, copper and zinc, are so richly charged with the precious metals, as they are in the Huronian rocks of Maine. So abundantly are the noble metals distributed through deposits of copper and galena, in

this country, that assayers and mineralogists are sometimes puzzled as to the proper designation of the ore, for it frequently happens that the test samples are more valuable for the gold and silver they contain, than for the lead and copper. In fact, it has already been proved by actual work, that the baser metals, which usually occur at the outcrop of the lodes, not infrequently have a tendency to gradually shade out and give place to the ores of gold and silver. It is, therefore, not unreasonable to expect, that many Maine mines now known as copper, or lead mines, will ultimately become productive deposits of the precious metals. The phenomenon of base metals gradually disappearing from veins carrying gold and silver,—especially silver,—is by no means a novelty however. The fact has been noted in every silver-mining locality on the globe. Many of the most productive mines of “free-milling ores” on the western side of this continent, were exceptionally base at the surface. The same may be said of the silver mines in South America, and of those in Western Europe. We may, therefore, confidently predict similar phenomena in the silver-yielding deposits of Maine.

According to the generally-accepted modern theory, that all ore deposits were mineralized through electro-chemical agencies, it is evident that intense heat, resulting from eruptive volcanic matter, was a prime factor in the process. It is safe to affirm that the most productive mines on the globe,—of either the precious or useful metals—all exist in the midst of greatly-disturbed volcanic regions. The entire inter-continental portion of North America mainly consists of a wild and desolate waste of extinct volcanic remains, and there, as all men know, have been discovered the richest and most extensive ore deposits the world has ever seen. The Atlantic border of Maine has been similarly ruptured and distorted by ancient eruptive forces, and here too, in the very heart of an interminable network of volcanic dykes, occur the richest and most massive deposits of the precious and useful metals. These facts are not only interesting to the mineralogist, but they are profoundly suggestive to the practical miner. If it be really true that the heat of volcanic matter was the prime cause of vein mineralization, mine owners may cease to consider the obtrusive and ever-present trap dyke, as such a terrible bugbear after all.

According to the new philosophy, the natural process of vein mineralization was comparatively simple, and may be rationally

explained. Indeed, any one who will familiarize himself with the ordinary processes of electro-metallurgy, or electro-plating, will readily catch glimpses of nature's handiwork in the grand laboratory.

During the past fourth of a century, scientists have evolved that proudest achievement of modern philosophy,—the “correlation and conservation of natural forces.” Through this wonderful discovery, men have learned that all modes of energy are exactly equal. That a given equivalent of heat, will produce a corresponding equivalent of electrical energy; and that the electrical action will in turn, generate a corresponding amount of magnetic force. The *modus operandi* of nature, in harmony with the new philosophy, may be clearly elucidated by comparison with the ordinary methods of electrolysis. If we closely observe the molecular action in a vessel containing a hot solution of any soluble salt, such as borax, alum, or chloride of sodium, we shall find that, when the solution cools to a certain degree of temperature, the salt molecules will be rapidly attracted toward the inner surface of the containing vessel, and will be there precipitated in the form of perfect and very beautiful crystals. In this proceeding, it is evident that the molecules of solid matter were *attracted* from the liquid solution by the magnetic force of the enclosing vessel. By a precisely similar process, all of the mineralized veins, deposits, and ore channels on the globe, were formed and filled with their infinite varieties of minerals and metallic contents. The antiquated notion that the metals were ejected from the molten interior of the planet, has, happily, been exploded, and the foremost scientists of our time very generally affirm that all metallic aggregations have been precipitated into the fissures and chambers of the rocks, from hot chemical solutions, through the agency and combining force of electro-magnetism. Von Cotta asserts that: “There can be no doubt that all true ore beds were originally formed by chemical or mechanical precipitation from water.”

After citing many instances where the processes of metallic precipitation are at this moment in active operation on the Pacific coast, Le Conte says: “We conclude, therefore, that metalliferous veins have been deposited from hot alkaline waters, circulating through fissures.”

Hopkins is emphatic in affirming the same opinion, as the following disconnected extracts from his famous work on “Terrestrial

Magnetism," will show: "That nearly all the substances which constitute the crust of the globe, are found *in solution* as well as solid, saturated throughout the rocks, and to such a degree sometimes as to issue out and form springs, is well-known. * * * * A magnetic, or galvanic current passing through solutions, if not the actual *modus operandi* of nature, is at all events capable of giving a rational solution, not merely of the mineral veins, but also of all the operations of nature disclosed by geology."

Gay, Lussac, Figuier, Dana, and many other reliable authors, all maintain the new philosophy of metallic precipitation from hot chemical solutions, and, in the words of Von Cotta, "there can be no doubt" of the truthfulness of their conclusions.

Notwithstanding the reasonableness of the electro-chemical hypothesis, there yet remains an unsolved problem in relation to mineral deposition. From whence came the vast aggregations of metallic ores which occur in the chasms and chambers of the rocks?—The laconic answer to this query is—they came from the adjacent strata. For countless centuries the elements have been ceaselessly disintegrating and wearing down the continental rocks, together with their metallic contents, to form new strata at the bottom of the ocean. Oceanic currents are the grand distributors of inorganic substances, and by their perpetual movements, metallic atoms have been widely disseminated through vast areas of the earth's solid crust. In referring to the distribution of gold atoms through the rocks, a distinguished American geologist says: "The gold in the veins is leached from the strata; the strata doubtless, received it from the sea, for small quantities of gold have been detected in sea water; but, again, doubtless the sea received it from the rocks."

The same principle of atomic distribution holds good with all other metals. M. Dieulafait states that "Copper exists in complete dissemination throughout the whole thickness of the primordial formations, the proportions varying much, but in no case was it necessary to use more than 100 gr. of rock, in order to isolate the metal. Copper also exists in all ordinary direct sedimentary deposits from primordial rocks, whether Silurian and infra-Silurian or reaching into the Trias."

In order to gather these widely distributed metallic atoms from the porous rocks, and to precipitate and combine them into appreciable masses, as they now occur in the earth, it was only necessary

for nature to invoke the aid of the subtle and potent agents — heat, electricity and magnetism.

As the promising copper bearing lode under consideration in this paper, rests in the midst of a district which has been greatly disturbed by ancient eruptive forces, and therefore is surrounded by conditions favorable to fertile mineralization — according to the accepted philosophy of modern mineralogists — my motive in presenting the above dissertations will be apparent.

COPPEROPOLIS MINE.

The mining property of the Copperopolis Mining Company is situated near the head of Taunton Bay — a tide-water channel, which is really a northwesterly extension of the magnificent sheet known as Frenchman's Bay. The mining works of the company are located a little to the west of the Ellsworth and Franklin highway, in the county of Hancock, State of Maine.

As the great ore channel upon which the Copperopolis is located, may be readily traced from east to west, to the distance of at least 3,000 feet; and as the ore thus far obtained from many surface openings along the outcrop of the lode, is an exceptionally rich yellow chalcopyrite, yielding by assay from 10 per cent to 30 per cent of copper; it is, unquestionably, one of the most important metalliferous deposits yet discovered on the Atlantic side of the continent. In addition to the great longitudinal extent and surprising richness of the output of this remarkable ore channel, its geological and lithological surroundings justify the opinion that, when properly exploited, it will yield prodigious quantities of splendid copper ore.

As before intimated in this report, the mine under consideration traverses a district of country which has been greatly disturbed by ancient eruptive forces. In fact, there are palpable evidences that the great fissure which now contains the ore, was itself formed by a subterranean upheaval. I arrive at this conclusion because the slaty zone in immediate contact with the principal ore channel, is flexed and elevated into the condition of a true anticlinal ridge, the very apex of which is traversed by the ore vein. The jagged and irregular form of the wall rocks enclosing the vein, indicated that they were rended asunder by a mighty lifting force from below. The anticlinal elevation referred to, is not abrupt, or

sharply defined, however; but simply resembles a prolonged rock-wave, bisected at, or near the summit.

The enclosing rocks of the Copperopolis lode are greenish-black chlorite slates; argilo-micaceous schists; occasional sections of laminated quartzite, inter-stratified with tough greenish-gray Diorite, and others of the metamorphic magnesian series. At the distance of about 200 feet south from the main ore vein, the southern margin of the zone of slaty rocks just described, is bordered by an expansive bed of extremely obdurate Diorite. This Diorite seems to form the boundary, or limit of the south half of the anticlinal mentioned above.

Immediately to the north of the lode, the rocks are less exposed and are therefore more difficult to classify; but, from the fact that within a third of a mile in that direction, another valuable copper mine, (the Robert Emmet,) rests in a parallel zone of schistose and slaty strata, it is fair to infer that both the lodes named, traverse the system of magnesian rocks.

In the vicinity of the Robert Emmet works, and about the head of Taunton Bay, the rocks have been deeply cut by ancient glaciers, and in this portion of the field we find tangible evidences of the volcanic forces referred to in another part of this history.

Like most of the mineralized veins thus far discovered in Maine, the Copperopolis lies conformable with the original stratification, or lamination of the upturned sedimentary strata which environ it, and at this juncture, I desire to offer a protest to what I deem to be an error of opinion, on the part of certain contemporary geologists, in relation to the name and nature of such mineral deposits. Many of those gentlemen persist in asserting that a "true fissure vein" cannot exist in the natural lamination of sedimentary strata. That all such veins are merely *bed* veins, similar in structure to coal veins and peat beds. That all veins traversing the natural laminations of sedimentary strata were, like the strata themselves, originally deposited in horizontal layers, and were subsequently, and simultaneously tilted up toward the vertical, like all other flexed and tilted strata. Those gentlemen affirm that the only species of deposit which may be entitled to the designation of a "true fissure vein," exists only in the metamorphic jointings, or cleavage fractures of secondary rocks. Now, with due deference to the opinions of others, I respectfully submit that such teaching as the above, is not only unphilosophical, but that it is actually detri-

mental to the mining interests of the world. The absurd notions of the gentlemen referred to, in reference to vein formation, and also as to vein mineralization, are simply threadbare vestiges of the antiquated philosophy which taught that all ore veins were merely igneous extrusions from a hypothetical molten source, at some inconceivable point in the interior of the planet. Men may as well learn now, as at a later day, that ore veins did *not* spew up from molten depths. They may also learn that the deep fractures in the sedimentary rocks, were formed by the secular movements of the earth's surface, possibly millions of ages before they received their silicious and metallic contents by *precipitation from chemical solutions*. The simple truth is, that rocks split easier along their lines of natural stratification than in any other direction; and I affirm that a vein traversing such a fracture, is, in the fullest sense, the best kind of a "true fissure vein," and that it is likely to penetrate to greater depths in the earth than any known species of mineral deposit. It may be safely assumed that a fissure occurring in the original lamination of an upturned sedimentary bed, will at least extend to the very bottom of the synclinal flexure of the tilted mass; and as there are innumerable sections, or zones of synclinal and anticlinal Huronian strata in Maine — the upturned edges of each section being many miles in lateral surface diameter — it is reasonable to conclude that fissures and veins penetrating these rocks, are practically unfathomable. The simple truth is, that rocks like logs of wood, split easiest along their lines of growth, or lines of least resistance; and for this plain reason, a fissure along the original lamination of strata must necessarily be profound in length and depth.

Another important and highly-encouraging characteristic of ore veins which traverse the strata lines of sedimentary rocks, is the tendency of such veins to rapidly expand laterally, as they descend from the surface. This curious phenomenon of vein-expansion below the surface, has never been satisfactorily accounted for. I shall venture the opinion, however, that it may be occasioned by constant heat at great interior depths of the globe,—to account for the gradual widening of the fissures below,—and to the perpetual radiation of planetary heat into space; thereby cooling and contracting the rocks at the surface, and causing the veins to be obdurate and narrow at the outcrop.

Whether this be sound philosophy or otherwise, the fact remains

that ore veins traversing metamorphic sedimentary strata, almost invariably increase in width as they descend into the earth. In referring to this "widening" characteristic of ore veins, as well as to their reliability at profound depths, Von Cotta says: "Up to the present time it has never been proved that a lode has been followed to its end; that is, to where the fissure actually ceased. Most of the stated cases concerning the wedging-out of veins, or their becoming sterile with increased depth, rest on the fact that ores are generally irregularly distributed in the veins. As long as the fissures exist, there remains a possibility of their widening out and containing ore."

Surely, in the foregoing pages of this Report, I have advanced solid argument sufficient to satisfy any reasonable person, that the old Huronian strata of Maine are fully charged with reliable, permanent, and fertile deposits of the precious and useful metals; and I shall therefore spare the reader the tedium of further discussion.

Although the chief amount of prospecting work at the Copperopolis has been performed upon what may be termed the "main discovery lode," yet it has been proved by numerous surface excavations, that another well-mineralized vein traverses the same anticlinal ridge, or slaty zone, mentioned at a preceding page. Judging from the appearance of this second member of the group by its width and fertility at points of exposure, it bids fair to become a rival to its parallel neighbor.

In addition to the two principal ore channels of the Copperopolis lode, the intervening slates and wall rocks of the veins all seem to be more or less mineralized with sulphuret and other ores of copper. It may be worthy of note, that experience has proved that the mineralization of the strata in the immediate vicinity of an ore channel, is a favorable augury of fertility to the vein itself. The general mineralization of the strata surrounding the great ore channel of the Douglass Mine at Bluehill, affords a fine illustration of the fact just stated.

As the work thus far performed upon the Copperopolis property is mainly superficial, the descriptive delineation of the mine may be briefly given:

By the compass, the general trend of the ore channels as well as of the environing strata, is nearly due east and west,—the same having an average dip toward the north, of forty-five degrees from the horizon.

As before stated, the trend of the Copperopolis ore channel is very nearly east and west,—magnetic. The Company holds title to fifty rods — linear measure, — along the line of the principal, or northern vein, referred to above; the line extending westerly from a point immediately west of the Ellsworth and Franklin road, to the eastern boundary of the Huronian mine location. The Company's surface title also embraced an area of twenty-five rods in width on the north and south sides of the lode. In brief, the dimensions of the Copperopolis Company's mining lot, is fifty rods square.

The first prospecting work performed upon the lode, was at a point near the centre of the Company's property. Here an excavation was made upon the vein to the depth of about ten feet. This opening yielded some extremely rich *chalcopyrite*, of bright golden color and brilliant lustre; but, owing apparently, to a local disturbance, the ore channel at this point was narrow, and imperfectly formed, so that the Company concluded to commence permanent work at a more favorable location further toward the west. Accordingly, at a spot not far from the western boundary of the claim, a shaft was driven to the depth of twenty-two feet. In this opening the vein was found to be much more perfectly defined, and the ore deposits more homogeneous than at the first excavation. Even here, however, the vein shows signs of local perturbation, for the principal band of sulphuret ore encountered at the bottom of the shaft, suddenly expands from a narrow seam of six inches in width, to a band of solid mineral five feet in lateral diameter. (I here desire to state that I am dependent upon hearsay for my knowledge of the conditions of the lode at the point under consideration. The shaft contained some water at the time of my visit, and I was unable to examine the workings myself. Mr. B. Mullan, who superintended the work, was my informant, and as he is a gentleman of unquestionable veracity, I do not doubt the truth of his statements.)

As the ore channel in the new shaft rapidly widens from the surface downward; and as the strata on both sides of the lode are palpably more or less mineralized with both native and red oxide of copper, there are strong indications of a rich deposit of ore at that point, when a reasonable depth from the surface shall be attained.

From time to time, during the past year, many surface-pits and

cross-cuts have been made at various points along the line of both the ore channels of the Copperopolis, and wherever the veins were cut, rich copper sulphuret has been encountered. Although this prospecting work was merely superficial, yet it serves to pretty clearly determine the nature and trend of the principal ore channels, as well as to show the character of their mineral contents. On the 11th of the present month, I selected from the various openings on the property, a lot of samples for analysis. These samples were selected without regard to their apparent richness, and solely for the purpose of obtaining, as near as possible, an average value of the minerals along the entire ore channel. On the 12th inst., Mr. Thos. Cahill, formerly of the U. S. Mint, at San Francisco, California, and now Superintendent of the Sullivan and Waukeag Mines and Mill, at Sullivan, Maine, submitted the certificate of assay, of which the following is a copy :—

WEST SULLIVAN, ME., April 12, 1881.

Prof. W. F. STEWART.

Dear Sir:—The following is the result of ore containing sulphuret of copper submitted by you for assay: Copper, $12\frac{5}{10}\%$.

Respectfully yours,

(Signed.)

THOMAS CAHILL,
Assayer.

When we take into account that the samples for the above test, were taken indiscriminately from all parts of the lode, and without the least regard to their apparent value, the result given by Mr. Cahill is very good indeed—especially when it is known that many samples of chalcopyrite from the same mine, have yielded by assay, more than thirty per cent, of copper.

In addition to the surprising richness of the Copperopolis ores in metallic copper, it may be of interest to the owners of the property to know that the mine also yields by assay, a fair percentage of the royal metal. To prove this, I have been permitted to use the following certificate :—

WEST SULLIVAN, ME., April 12, 1881.

Copy of assay made from Custer Copper Mine; sample taken by myself, September 12, 1880. Silver per ton, \$7.28; per cent of copper, $31\frac{6}{10}\%$.

THOMAS CAHILL,
Assayer.

(At the time the above assay was made by Mr. Cahill, the Copperopolis property was known as the "Custer Mine.")

In another portion of this report, I used words of expression which, to those unfamiliar with the geological structure of the lode, as well as with the surprisingly rich mineral output of the mine, may seem florid and extravagant. The exceptionally favorable opinion which I have formed of this property, is not wholly based upon the great extent of the ore channel; nor upon the peculiar mineralization of its surface surroundings; nor upon the surprising richness of its cupriferous output; but, for the twofold reason, that it is a wonderfully fertile copper deposit, containing an encouraging percentage of precious metal. The subjoined certificate of assays made from time to time, by State Assayer Fisk, of Ellsworth, Maine, will clearly explain my meaning:—

ELLSWORTH ASSAY OFFICE,

ELLSWORTH, ME., April 16, 1881.

Dr. L. W. HODGKINS.

Sir:—Following is a full report of the assay made by me, of ore from the Custer Mine, in Egypt District, Hancock County, Maine, giving the date of making the assay, and value per ton of 2,000 pounds:

1880.	
JUNE 10.—Gold, none.	
Silver, 3 7-10 ozs. . . .	\$4.25
Copper, 11 2-10 %	40.32
	44.57
„ 11.—Silver, 4 6-10 ozs. . . .	\$5.29
Copper, 14 3-10 %	51.48
	56.77
„ 16.—Silver, 4 6-10 ozs. . . .	\$5.29
Copper, 12 7-10 %	45.72
	51.01
„ 17.—Copper, 18 4-10 %	66.24
„ 18.—Silver, 9 5-10 ozs. . . .	10.92
JULY 10.—No. 1 { Silver, 3 2-10 ozs.	3.68
Blue Ore, { Copper, 26 8-10 %	96.48
	100.16

JULY 10.—	No. 2	}	Silver, 4 3-10 ozs.	4.94	
	Red Ore,		Copper, 14 7-10%	52.92	
					57.86
„	19.—		Silver, 7 4-10 ozs.	8.51	
			Copper, 31 3-10 %	114.68	
					123.19
SEPT. 18.—			Silver, 4 2-10 ozs.	4.83	

Yours respectfully,

WINTHROP W. FISK, B.S.,

State Assayer.

On a preceding page I stated that the wall rocks of the lode at the main working shaft, are mineralized with native copper and red oxide of copper. As this feature of the Copperopolis, is not only a novelty, quite exceptional in the cupriferous deposits of Maine, but may also prove to be of great intrinsic value to the property, it certainly deserves more than a passing notice. A large proportion of the slaty wall material which has been taken from the shaft, is fairly red with the oxide of copper, and with thin laminae of pure metallic copper. By reference to the above certificate of State Assayer Fisk, it will be seen that a sample marked "Red ore," was assayed by that gentlemen, on the 10th of July, 1880, and yielded nearly fifteen per cent, of copper; I myself, made several acid tests upon the oxide blotchings, and in every instance succeeded in isolating pure metallic copper.

The following are copies of Certificates of assays, made by Professor S. P. Sharples, of Boston, Mass.

BOSTON, MASS., Feb. 25, 1881.

TO GEO. E. HARRINGTON.

Dear Sir:—The sample of Pyrites, marked "Copperopolis," received from you submitted to me for examination, contains:

Copper. 32.67%.

It is pure chalcopyrite.

Respectfully,

S. P. SHARPLES,

State Assayer.

BOSTON, MASS., April 19, 1881.

TO GEO. E. HARRINGTON.

Dear Sir:—The sample of Pyrites, marked "Copperopolis," No. 1, received from you, submitted to me for examination, contains:

Copper 32.48%.

Respectfully,

S. P. SHARPLES,

State Assayer.

BOSTON, MASS., April 19, 1881.

TO GEO. E. HARRINGTON.

Dear Sir:—The sample of Pyrites, marked "Copperopolis" No. 2, received from you, submitted to me for examination, contains:

Copper 17.50%.

Respectfully,

S. P. SHARPLES,

State Assayer.

In addition to the rich sulphuret ores of the vein proper, it is quite evident that even the environing slates of this remarkable lode, may prove to contain workable and remunerative quantities of copper.

To those who have had the patience to follow me through this somewhat protracted delineation, I have only to add in conclusion, that the structural conditions, lithological environments and character of mineralization of the Copperopolis lode, all fully come up to the requirements of a first-class copper deposit, and I therefore confidently predict that when the mine shall be fairly and systematically developed, it will prove to be one of the most remunerative copper mines in this country.

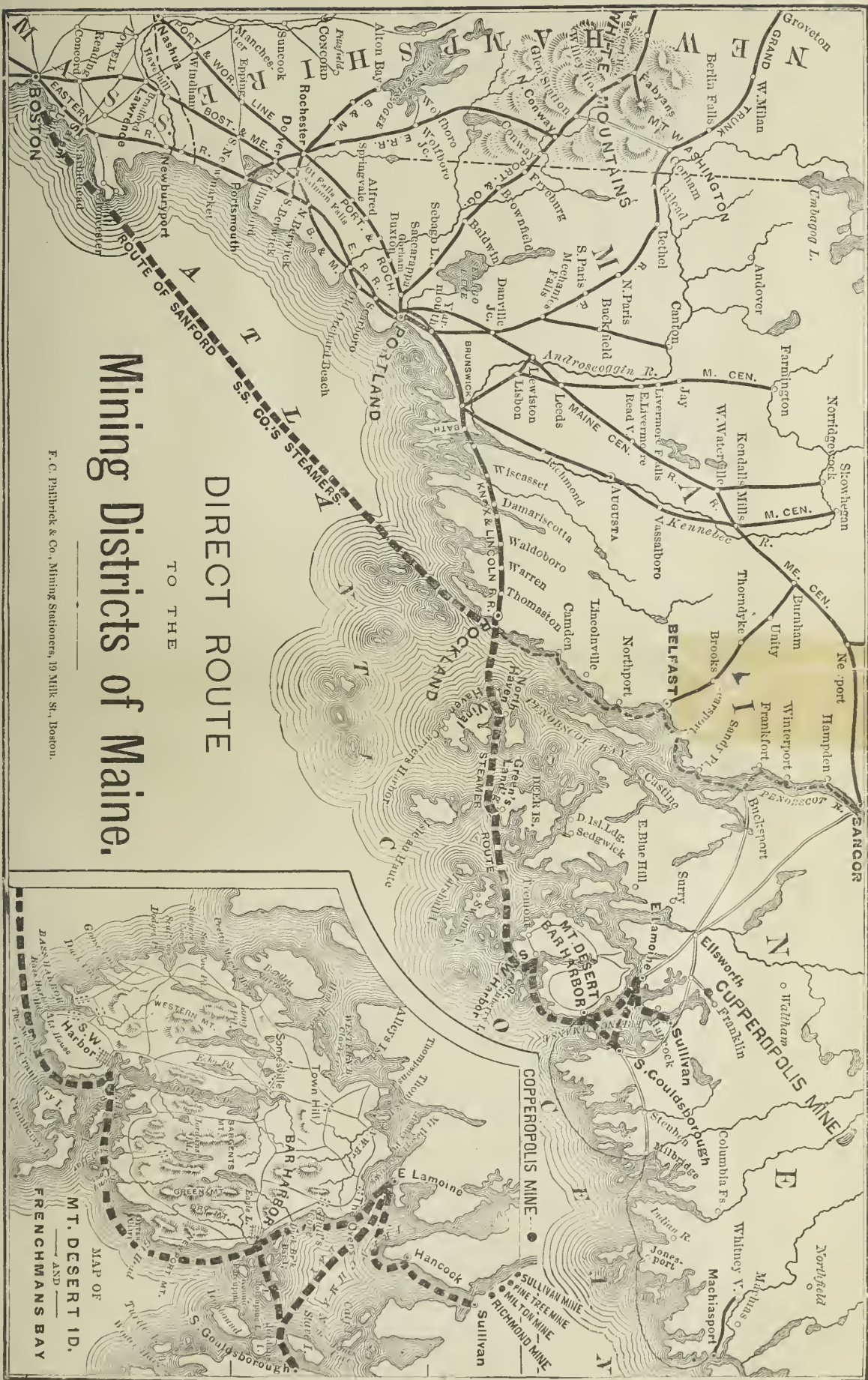
I have the honor to be,

Very sincerely yours,

W. F. STEWART.



PLAN
SHOWING THE PROPERTIES
OF THE
COPPEROPOLIS, HURONIAN,
STARR, MILTON,
RICHMOND, PINE TREE & SULLIVAN
MINING COMPANIES.
HANCOCK COUNTY, MAINE.



Direct Route TO THE Mining Districts of Maine.

F. C. Phillips & Co., Mining Stationers, 19 Milk St., Boston.

